Manual
Connecting ArtiMinds RPS to a Fanuc Robot

Client Setup Instructions

Version 1.9

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Contact

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Content

1   Setup

1.1   Robot

1.1.1   Supported Controllers:

1. R-30iB
2. R-30iB Plus

1.1.2   Required software packages

1. R796 ASCII Program Loader
2. R648 User Socket Msg
3. To check the installed software packages go to MENU => NEXT => STATUS => Version ID => NEXT => ORDER FI

1.1.3   Configure FTP

1. FTP Server should be configured by default. If not, follow the steps below.
2. On the fanuc teach pendant press MENU
3. Go to SETUP => Next => Host Comm
4. Press [SHOW] => Servers
5. S1 and S2 should be configured as FTP with auto-start by default, if not configure them according to the screenshot below. To set "Current State" to "STARTED", first press [ACTION] => DEFINE and then press [ACTION] => START
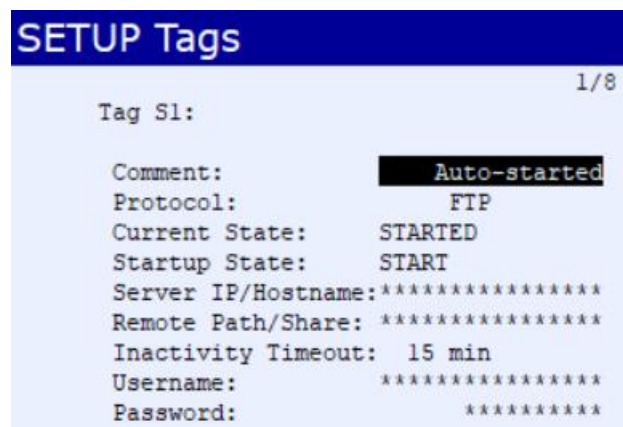
6. Press MENU => NEXT => SYSTEM => Variables
7. Go to $HOSTS_CFG and press ENTER
8. $HOSTS_CFG[1] $HOSTS_CFG[2] should be configured as FTP by default, if not configure them according to the screenshot below.

1.1.4   Configure TCP

1. On the fanuc teach pendant press MENU
2. Go to SETUP => Next => Host Comm
3. Press [SHOW] => Servers
4. Select S3 and press DETAIL
5. Note: If you want to use a different TCP Socket Tag than S3 with the ArtiMinds RPS, please contact the ArtiMinds Robotics Support (support@artiminds.com).
6. To set "Current State" to "STARTED", first press [ACTION] => DEFINE and then press [ACTION] => START
7. Configure S3 according to the screenshot below.

8. Press MENU => NEXT => SYSTEM => Variables
9. Go to $HOSTS_CFG and press ENTER

```
SYSTEM Variables
  $HOSTS_CFG[3]                    1/17
    1 $COMMENT        *uninit*
    2 $PROTOCOL       'SM'
    3 $PORT           *uninit*
    4 $OPER           3
    5 $STATE          3
    6 $MODE           *uninit*
    7 $REMOTE         *uninit*
    8 $REPERRS        FALSE
    9 $TIMEOUT        15
   10 $PATH           *uninit*
   11 $STRT_PATH      *uninit*
   12 $STRT_REMOTE    *uninit*
   13 $USERNAME       *uninit*
   14 $PWRD_TIMOUT    0
   15 $SERVER_PORT    4242
   16 $USE_VIS_PRT    FALSE
   17 $USE_UDP        FALSE
```

10. Configure $HOSTS_CFG[3] according to the screenshot. Set the $SERVER_PORT to the same value as the TCP port in the ArtiMinds Robot Configurator.

1.1.5   Setup autoexecution (optional)

1. Copy the KAREL programs to the robot controller using the "Copy KAREL Programs" button in the ArtiMinds Robot Configurator (see next section)
2. On the fanuc teach pendant go to MENU => NEXT => SYSTEM => Config
3. Set "Use HOT START" to TRUE
4. Set "HOT START Autoexec program" to the KAREL program AMRInit

1.2   ArtiMinds RPS

1. When installing the ArtiMinds RPS, make sure to copy the installation files to a local drive e.g. the Desktop (no network drives), before executing the installer. Otherwise installation errors may occur
2. Start the ArtiMinds Robot Configurator (File => Robot => Custom Robot)
3. Select one of the Fanuc robots
4. Follow the steps of the Robot Configurator until "Setup Communication"
5. Set the IP of your PC and the IP of the robot. To check the IP of the robot, go to MENU => SETUP => NEXT => HOST COMM => [SHOW] => Protocols => TCP/IP
6. Set the TCP Port to the value of $SERVER_PORT in $HOSTS_CFG[3] on the robot
7. Set the FTP Port to 21
8. If the Password functionality of the Fanuc (MENU => SETUP => Passwords) is not used, set the FTP User and FTP Password to arbitrary non-empty values (e.g. 'user' and 'password')
9. If the Password functionality of the Fanuc (MENU => SETUP => Passwords) is used, a user with at least 'PROGRAM' privilege (level 1) is required. Set the FTP User to the username and the FTP Password to the login password of this user
10. If a digital gripper was selected: Set the Digital Port Grasp and Digital Port Release according to the specifications of the gripper. Note: The gripper ports must have a value bigger than 0. The default gripper port 0 is not valid on fanuc robots. When using digital IOs for the gripper, please refer to the IO mapping in the robot manual

11. Make sure the PC and the robot are connected and in the same network
12. Select a robot controller and copy the KAREL files to the robot controller using the "Copy KAREL Programs" button
13. Run the KAREL program AMRComm on the robot. Note: The program needs to run at all time, otherwise no communication between the ArtiMinds RPS and the robot is possible
14. Run a connection test
15. Finish the ArtiMinds Robot Configurator

2 Operation

2.1 General Communication

1. Follow the steps listed in the Setup section.
2. Make sure the KAREL program AMRComm is running at all time.
3. The ArtiMinds RPS is able to communicate with the robot at all times, in all robot modes, without the need of user interaction on the robot. As long as AMRComm is running on the robot, the ArtiMinds RPS can communicate with the robot.

2.2 Moving the robot

2.2.1 T1 Mode

1. Make sure AMRComm is running on the robot.
2. Reset all faults on the robot before starting a robot motion.
3. The Fanuc safety features apply. The deadman switch on the robot teach pendant needs to be pressed before starting a robot motion and must be held while the robot moves.
4. When releasing the deadman switch on the robot teach pendant while the robot moves, the program is paused.

2.2.2 Auto Mode

1. Make sure AMRComm is running on the robot.
2. Reset all faults on the robot before starting a robot motion.
3. The Fanuc safety feature apply. No buttons need to be pressed.

3   Trouble-shooting

ArtiMinds RPS cannot communicate with the Fanuc robot

1. Check if AMRComm is running on the robot
2. Check the network settings on the robot and the ArtiMinds RPS (see Setup section for more)

Robot not moving

1. Check the operation mode of the robot (T1 or Auto) and read the section "Moving the robot"

Robot has error "MCTL-013 ENBL input is off"

1. On the fanuc teach pendant press MENU => NEXT => SYSTEM => CONFIG
2. Set the option "Enable UI signals" to FALSE

ArtiMinds RPS has error when trying to copy the KAREL programs to the Fanuc robot

1. On the Fanuc teach pendant press SELECT and make sure that no AMR KAREL program is selected (e.g. AMRComm) and select a different program that does not start with AMR
2. If there is still an error press SELECT => [TYPE] => All and delete all AMR KAREL programs. Make sure to delete the PC and the VR file for each program

Connection test in the ArtiMinds Robot Configurator fails

1. Make sure everything is configured according to section 1
2. When using grippers or cameras make sure to configure them correctly
3. Make sure that the KAREL programs have been copied to the robot and that AMRComm is currently running on the robot
4. If the connection test still fails press „Skip" to skip the connection test. To test if everything is working switch to online mode and press the record button. If the robot pose in the ArtiMinds RPS is updated to the robot pose of the real robot, the communication is working correctly
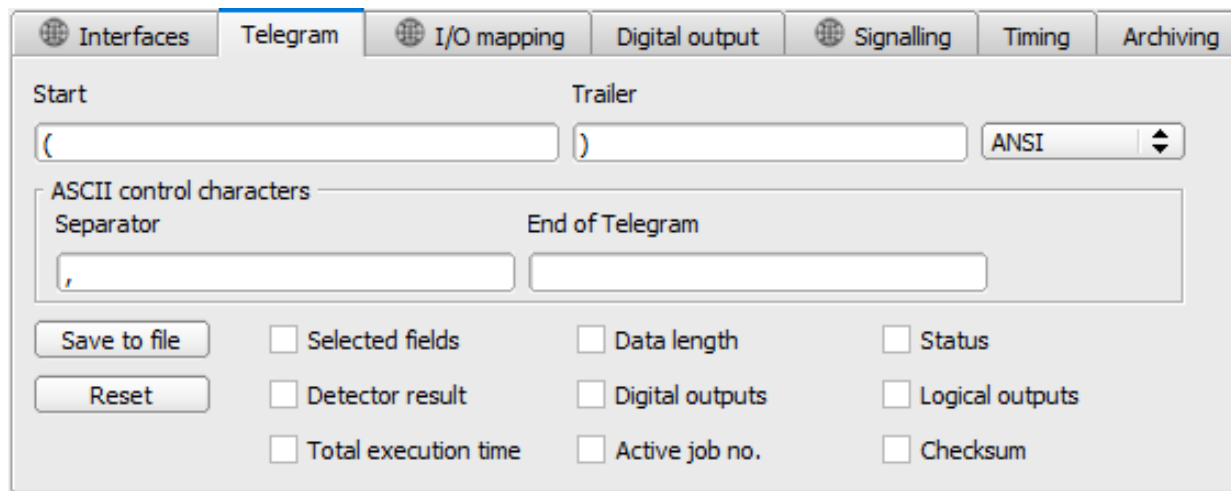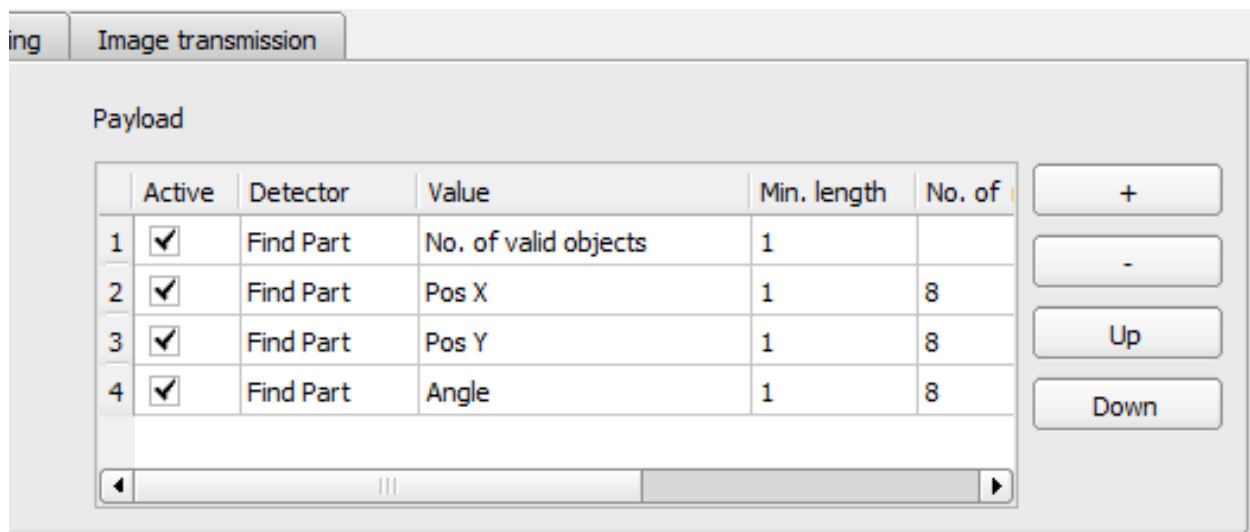
4   Vision

In order to enable the RPS to run with a vision system on the fanuc robot, a few camera-specific settings need to be adjusted both on the camera and the robot controller:

4.1   Sensopart

First of all, the job settings of the SensoPart camera need to be set to match the expected output format. You can do so by editing your camera job settings in Visor and then selecting the "Output" option for each job. Go to the tab "Telegram" and make sure the telegram format is set to the following settings:

Note, that you need to do this for every single job that you intend to use later on!

Also, check the tab "Interfaces" and make sure, that TCP/IP connections are enabled for your camera. Here, you can also check the camera's In and Out ports, as you will need these port numbers later on. (Default values are: In=2005, Out=2006)

Next, you will need to configure the connections between your camera and the fanuc robot.

1. On the fanuc teach pendant press MENU
2. Go to SETUP => Next => Host Comm

3. Press [SHOW] => Clients
4. Select C1 and press DETAIL

```
SETUP Tags                                    ^ ⊡
                                        7/9
    Tag C1:

    Comment:              ****************
    Protocol:                   SM
    Current State:        STARTED
    Startup State:        START
    Server IP/Hostname:   192.168.180.30
    Remote Path/Share:    ****************
    Port:                 2005
    Inactivity Timeout:   15  min
    Username:                   anonymous
```
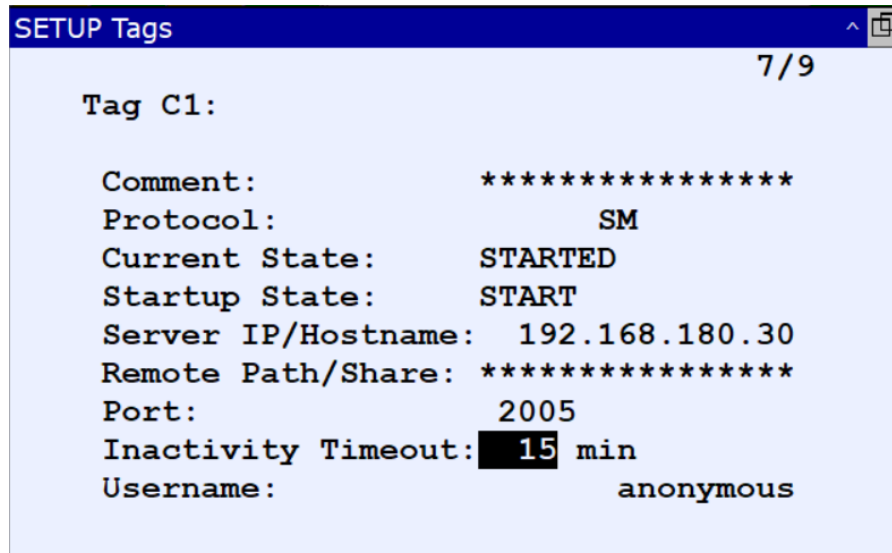
5. Configure C1 according to the screenshot below to be used as the camera's In port. To set "Current State" to "STARTED", first press [ACTION] => DEFINE and then press [ACTION] => START
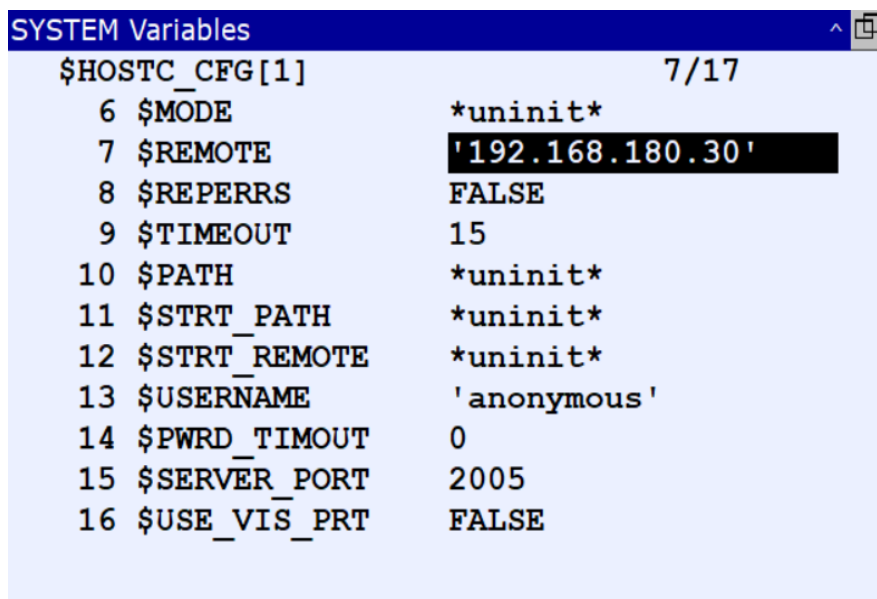6. Do the same with C2 and the camera's Out port.
7. You can also use different client Tags than C1 and C2 as well, you just need to adjust them within the RPS later on.
8. Press MENU => NEXT => SYSTEM => Variables
9. Go to $HOSTC_CFG and press ENTER

```
SYSTEM Variables                              ^ ⊡
    $HOSTC_CFG[1]                    7/17
     6 $MODE          *uninit*
     7 $REMOTE        '192.168.180.30'
     8 $REPERRS       FALSE
     9 $TIMEOUT       15
    10 $PATH          *uninit*
    11 $STRT_PATH     *uninit*
    12 $STRT_REMOTE   *uninit*
    13 $USERNAME      'anonymous'
    14 $PWRD_TIMOUT   0
    15 $SERVER_PORT   2005
    16 $USE_VIS_PRT   FALSE
```

10. Configure $HOSTC_CFG[1] and $HOSTC_CFG[2] according to the screenshot. Set $SERVER_PORT and $REMOTE to the IP and ports of your camera and $PROTOCOL to 'SM'. (If you chose different Tags than 1 and 2, you need to configure the matching $HOSTC_CFG here instead).

Finally, you can setup the robot and the camera within the RPS. Do so by navigating to File => Robot => Custom Robot. Here you can select your robot along with the SensoPart camera. Make sure to select the correct mounting for your camera (either robot-mounted or stand-alone). Once you reach the communications page of the configurator, enter the client Tag numbers that you have previously configured on the robot controller:

SensoPart (robot-mounted camera)

Tag (In): C1 ?

Tag (Out): C2

4.2   iRVision

Before starting to use iRVision with the RPS, first set up the camera according to Fanuc's iRVision OPERATOR'S MANUAL. Configure the camera and set up a vision process that you want to use in your program over the iRVision web interface.

Next, configure a new Fanuc robot in the RPS and add iRVision as a vision component. In the "Setup Communication" step, you will now have the option to register the vision processes that you intend to use. For each vision process that you add, a "Job id" will be created, which you can later use to setup a vision template. Alternatively to entering the processes by hand, you can also use the button "Retrieve Vision Processes", which will attempt to retrieve the configured vision processes directly from the controller.

Fanuc iRVision (stand-alone camera)
Please specify the iRVision-processes on the robot.
These processes will be made available within the RPS as 'jobs' with the given job id.

	Job id	Process Name
-	0	MY_VISION_PROCESS
+		

Retrieve Vision Processes

5   Force

5.1   Required software packages

1. Force Control Basic (J876)
2. Force Ctl. Contouring (J835)

5.2   Robot setup

1. On the Fanuc teach pendant press DATA => [TYPE] => Force Ctrl
2. Select one of the Force Ctrl Schedules the RPS should use and press DETAIL
3. Note: The start index of the Force Ctrl Schedule used by the RPS can be set in the Fanuc settings page in the RPS. The RPS requires three Force Ctrl Schedules (start index, start index + 1 and start index + 2). All data in these Force Ctrl Schedules will be overwritten when executing a program from the ArtiMinds RPS
4. Select Function, press [CHOICE], select "Face Match" and press YES
5. Repeat this process for all three Force Ctrl Schedules used by the RPS

6 Zimmer grippers

6.1 ArtiMinds RPS setup for a new robot

1. Configure a new Fanuc robot with a Zimmer gripper using the Robot Configurator (File => Robot => Custom Robot)
2. Follow the steps of the Robot Configurator until "Setup Communication"
3. Follow the steps described in section 1.2 to setup basic communication between the ArtiMinds RPS and the Fanuc robot (copy KAREL programs and start AMRComm)
4. Set "Group I/O configuration" to "custom" to open the Zimmer gripper configuration menu
5. Configure the parameters according to hardware configuration (RACK and SLOT) and according to the desired digital and group indices. When using manually configured digital or group I/Os make sure they don't collide with the I/Os used for the Zimmer gripper (move the I/Os used for the Zimmer gripper).
6. For further information regarding these parameters please see the tooltips in the ArtiMinds RPS or the official Fanuc manual
7. Use the "Write configuration to robot" button to write the I/O configuration to the Fanuc robot. Restart the robot controller for the changes to take effect.
8. Make sure to start AMRComm and try to move the gripper using the "Open Gripper" and "Close Gripper" buttons. The gripper should move slightly.
9. Use the "Run Connection Test" button to perform a connection test

6.2 ArtiMinds RPS setup for an existing robot

1. Go to File => Settings
2. Select the Fanuc robot in the left column
3. Select the "Group I/O" tab
4. See the section above for an explanation on how to configure the parameters

7 Error reporting

When encountering an error, please provide the following information to the ArtiMinds Robotics Support (support@artiminds.com):

1. ArtiMinds RPS log file Documents\ArtiMinds RPS\inrop.log
2. Describe the actions that lead to the error
3. Fanuc robot debug output
4. On the fanuc teach pendant press MENU => USER
5. Logging messages from the ArtiMinds RPS Communicator are printed on this screen
6. .artm file of the project

Notes

Changelog

v1.0   initial version

v1.1   added table of contents

v1.2   updated document layout

v1.3   added section about copying of programs from ArtiMinds RPS to the robot

v1.5   added section about Vision and Force

v1.6   added section about Zimmer grippers

v1.7   extended Troubleshooting and ArtiMinds RPS

v1.8   added section about iRVision

v1.9   updated document layout